



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,822	08/18/2006	Sung-Man Lee	CMT0022US	5934

23413 7590 01/21/2011  
CANTOR COLBURN LLP  
20 Church Street  
22nd Floor  
Hartford, CT 06103

EXAMINER
----------

YANCHUK, STEPHEN J

ART UNIT	PAPER NUMBER
----------	--------------

1729

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

01/21/2011

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

usptopatentmail@cantorcolburn.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/538,822	<b>Applicant(s)</b> LEE ET AL.	
	<b>Examiner</b> STEPHEN YANCHUK	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on 10/20/2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-11 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-9 and 11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. All previous rejections are removed since they did not teach an etchant on the current collector to form the surface morphology
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in prior office action.

### ***Claim Rejections - 35 USC § 103***

1. Claims 1, 3, 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al (USPAT 7410728), and further in view of Kawakami et al (USPAT 6063142).

Claim 1, 3: Fujimoto teaches a copper current collector for an electrode of a secondary battery [Abstract]. The electrode comprises microcrystalline or amorphous silicon thin film active material [Abstract]. The copper film is taught to have a surface roughness Ra of .037 $\mu$ m-.223 $\mu$ m (more broadly to .001-1 $\mu$ m, Claim 6), a mean spacing of 8 $\mu$ m-14 $\mu$ m, and a deflection portion between 20 $\mu$ m-200 $\mu$ m [C12:L40-70]. Fujimoto fails to teach that the morphology of the copper element is formed through an etchant process.

Kawakami teaches a secondary battery electrode [Abstract]. The anode surface is taught to have a roughened state through etching [11:45-54]. In the case of a copper substrate, a mixture of ferric chloride and hydrochloric acid is taught [11:45-12:25]. Water is a known diluting agent for acids and acts to slow down the surface roughness effects; this is well known to be addable to the mixture to make processing easier and safer. It would have been obvious for one of ordinary skill in the art to modify Fujimoto

Art Unit: 1795

with Kawakami because Kawakami teaches roughening the surface preserves the longevity of the current density of the battery [11:50-53].

Claim 5: Fujimoto teaches the use of an interlayer between the current collector and the active material as an “adhesive layer” [C1:57-62]. The anode active material of Silicon is deposited by CVD, sputtering, vapor evaporation, spraying, or plating [Claim 12]

Claim 6: Fujimoto teaches the interlayer to be a material alloyable with the active material [C1:57-62]. Alloyable material is taught to be Zirconium [C3:3-15].

2. Claims 4, 7-9, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al (USPAT 7410728) and Kawakami et al (USPAT 6063142), as applies to claim 1 and further in view of Zhang et al (PGPUB 2004/0018424).

Claim 4, 7: Fujimoto and Kawakami teach a silicon active layer on a roughened electrode where the silicon layer is deposited via sputtering [Claim 12]. The prior art does not teach a bias voltage applied to the current collector during sputtering since the specifics of the sputtering are not revealed.

Zhang teaches a thin film battery where an active material is added via sputtering. A bias is added to the substrate to increase the ion bombardment and crystallize the active material film [23]. It would have been obvious to use the sputtering method of Zhang to modify the prior art because Zhang teaches a method that increase control of the stress of the deposited material during the sputtering process [23].

Claim 8-9, 11: Zhang teaches a heating step of 300-350°C for one hour [23].

The properties of the heating step are inherent to the material and will therefore increase bond ability. The prior art teaches the same method steps as the applicant has currently claimed and will therefore have the same properties pertaining to the bond ability.

3. Claims 4, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al (USPAT 7410728) and Kawakami et al (USPAT 6063142), as applies to claim 1 and further in view of Tamura et al (PGPUB 2002/0034687).

Claim 4, 7: Fujimoto and Kawakami teach a silicon active layer on a roughened electrode where the silicon layer is deposited via sputtering [Claim 12]. The prior art does not teach a bias voltage applied to the current collector during sputtering since the specifics of the sputtering are not revealed.

Tamura teaches a lithium battery having an Si film deposited via sputtering. A bias voltage is applied to the substrate [26]. It would have been obvious to combine Tamura with the prior art because Tamura teaches improved adhesion between the substrate and the silicon film [26].

4. Claim 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al (USPAT 7410728) and Kawakami et al (USPAT 6063142) and Tamura et al (PGPUB 2002/0034687), as applies to claim 1 and further in view of Zhang.

Art Unit: 1795

Claim 11: Fujimoto and Kawakami and Tamura teach a silicon active layer on a roughened electrode where the silicon layer is deposited via sputtering [Claim 12]. The prior art does not teach a post heating step.

Zhang teaches a heating step of 300-350°C for one hour [23]. The properties of the heating step are inherent to the material and will therefore increase bond ability. The prior art teaches the same method steps as the applicant has currently claimed and will therefore have the same properties pertaining to the bond ability. It would have been obvious to use the sputtering method of Zhang to modify the prior art because Zhang teaches a method that increase control of the stress of the deposited material during the sputtering process [23].

### ***Response to Arguments***

5. Applicant's arguments with respect to claims 1, 3-9, 11 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHEN YANCHUK whose telephone number is (571)270-7343. The examiner can normally be reached on Monday through Thursday 8:30am to 5:00pm.

Art Unit: 1795

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ula Ruddock can be reached on 571-277-1481. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/STEPHEN YANCHUK/  
Examiner, Art Unit 1795

/Ula C Ruddock/  
Supervisory Patent Examiner, Art Unit 1795